QZSS / MSAS Status

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QZSS Program Status (1)

- *Committee on the promotion of GIS and Positioning Information issued the Basic Policy on the Promotion of the QZSS project. (**March, 2006**)*
  - *As the 1st stage, technological verifications by R&D ministries and demonstrations by the private sector and user ministries will be carried out by using the first QZSS satellite.*
  - *The QZSS program will basically proceed to the 2nd stage on the government-private cooperation, after the evaluation of the results of technological verifications and demonstrations of the 1st stage.*
- *The development of the first QZSS satellite (QZS-1) started after the evaluation and approval by the Space Activities Commission. **(November, 2006)***

QZSS Program Status (2)

- *Satellite Positioning Research and Application Center (SPAC) was established aiming to promote QZSS utilization and application demonstration.* ***(February, 2007)***
- JAXA released the revised draft of Interface Specifications for QZSS and invited public comments. ***(June, 2007)***
- The manufacturing of the NAV payload PFM started after its CDR was completed. ***(June, 2007)***
- The development of the first QZSS satellite proceeded to the critical design phase after completion of its PDR. ***(August, 2007)***
- The Fundamental Act of Promotion for Utilization of Geographical Spatial Information entered into force. ***(August, 2007)***

The Fundamental Act of Promotion for Utilization of Geographical Spatial Information

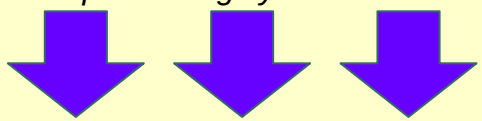
<Extract>

- **§ 9 Establishment of the basic promotion plan for utilization of geographical spatial information**
  - *Article 9; The Government shall establish a basic promotion plan for utilization of geographical spatial information in order to execute policies for promotion of the utilization of geographical spatial information comprehensively and strategically.*

- **§ 10 Establishment of cooperation system among relevant government organizations**
  - *Article 10; The Government shall execute essential policies to establish the cooperation system by relevant government organizations and the others, concerning the establishment of the basic promotion plan for utilization of geographical spatial information and the execution of policies based on this plan.*

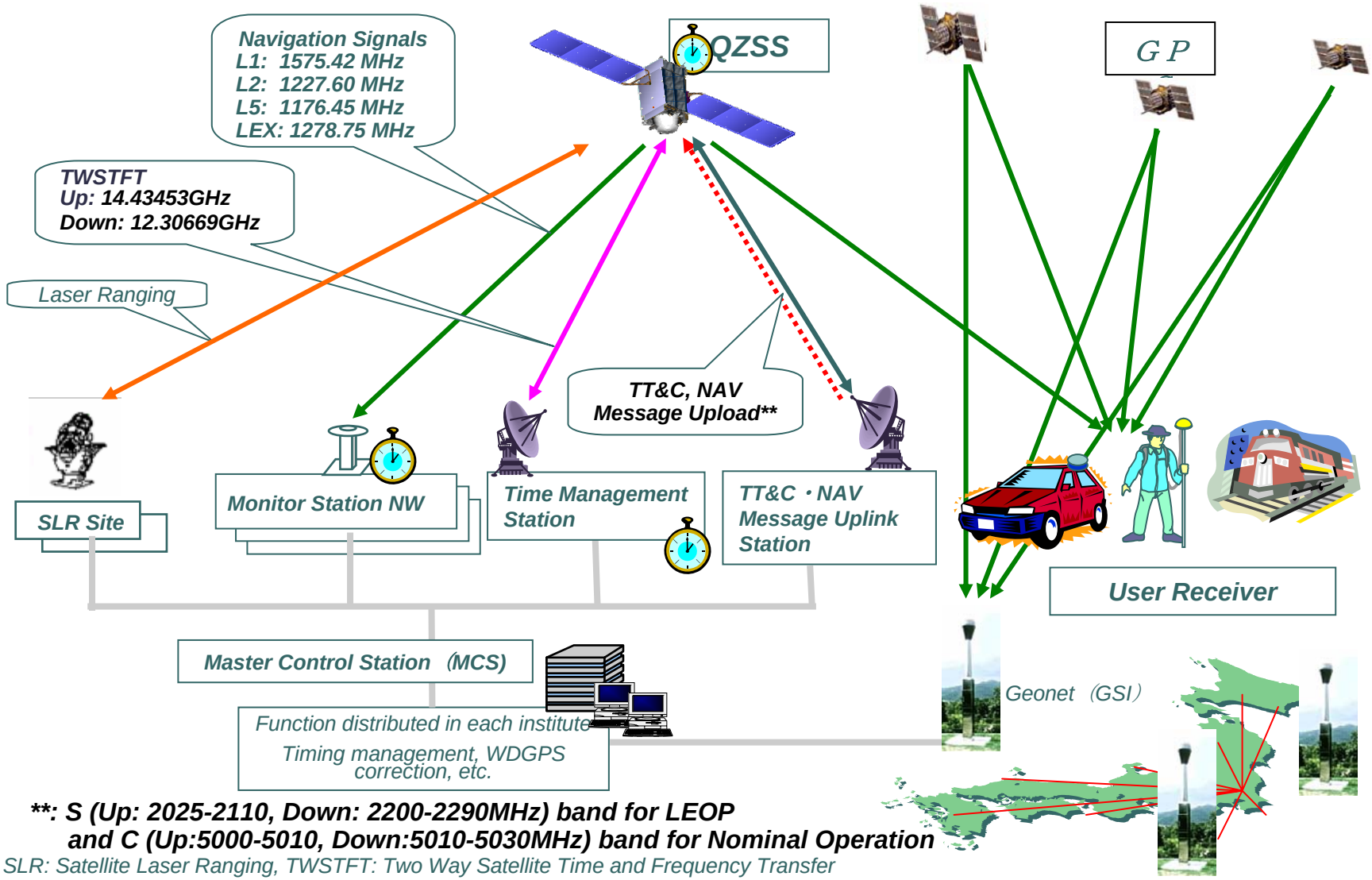
- **§ 20 Contacts with operators of global satellite based positioning systems**
  - *Article 20; The Government shall execute essential policies to maintain necessary contacts with the operators of global satellite based positioning systems and the others, in order to promote the utilization of geographical spatial information by establishing the environment where reliable and stable satellite based positioning services can be effectively provided .*

- **§ 21 Promotion of R&D of satellite based positioning systems**
  - *Article 21; The Government shall promote R&D activities, technological verifications and demonstrations of satellite based positioning systems, and following them, execute necessary policies for encouragement of satellite based positioning applications considering their outcomes, in order to promote the utilization of geographical spatial information obtained by satellite based positioning systems.*



- **Establishment of relevant cabinet ministers meeting (Planned in 2007)**
- **Establishment of basic plan to promote necessary policies (Planned in 2007)**

System Description (1)
Demonstration System's architecture



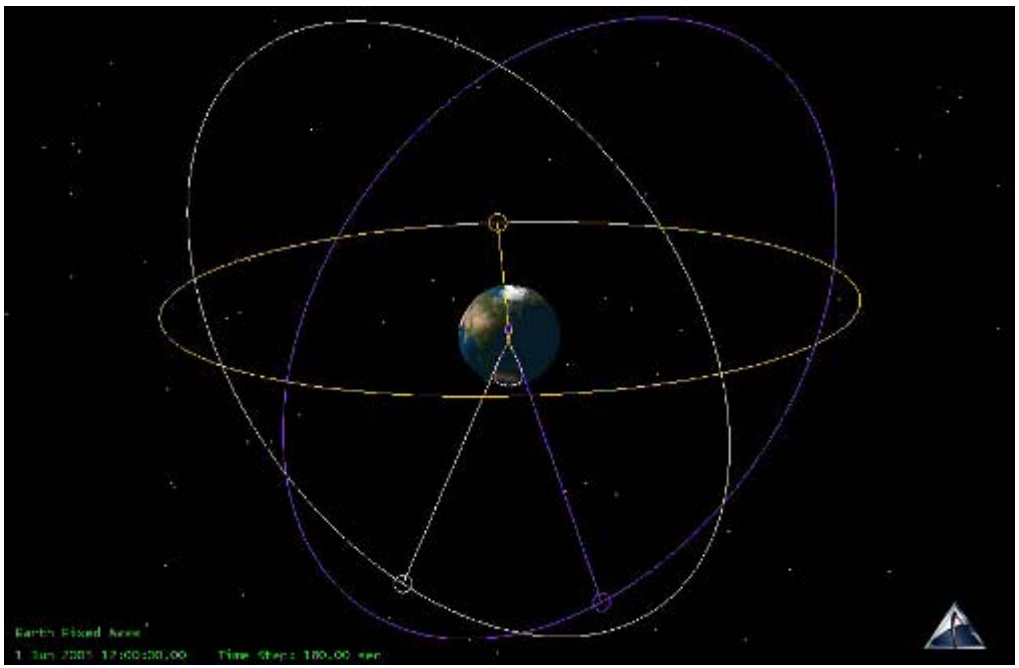
**: S (Up: 2025-2110, Down: 2200-2290MHz) band for LEOP
and C (Up:5000-5010, Down:5010-5030MHz) band for Nominal Operation

SLR: Satellite Laser Ranging, TWSTFT: Two Way Satellite Time and Frequency Transfer

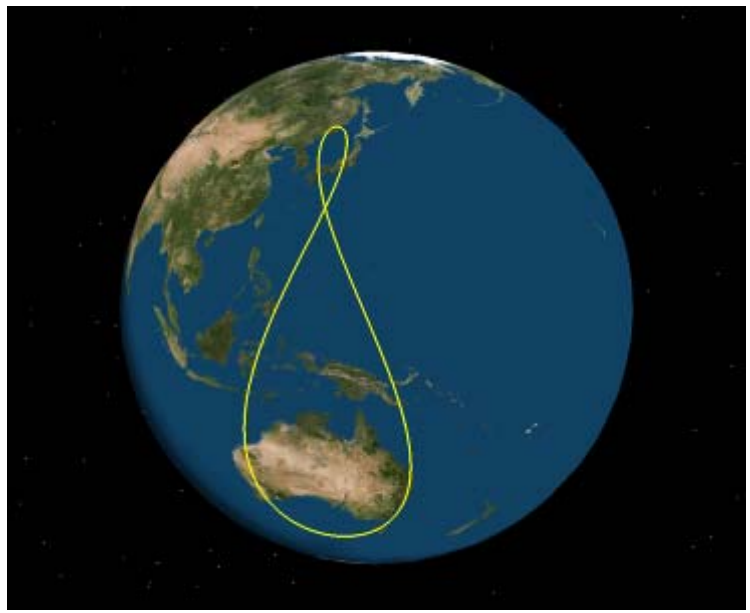
System Description (2)
Space Segment- Orbit characteristics

- *QZSS is designed that at least one satellite out of three satellites can be observed more than 60 degrees of elevation angle in Japan.*
- *Three IGSO satellites are in different orbital planes to pass over the same ground track.*

(a=42,164km, e=0.099, i=45deg, Ω= 120deg apart)



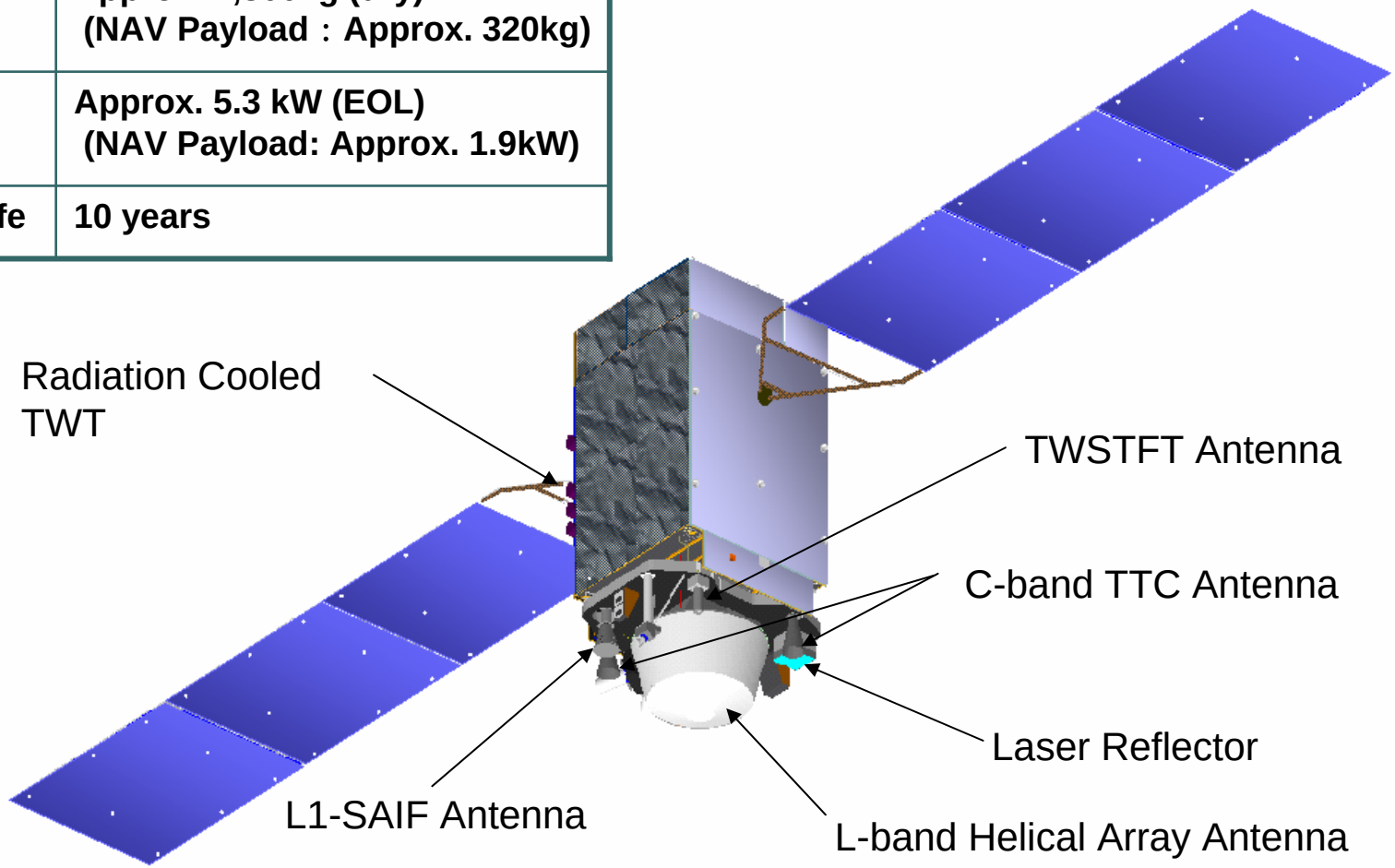
QZSS orbit constellation



QZSS Ground Track

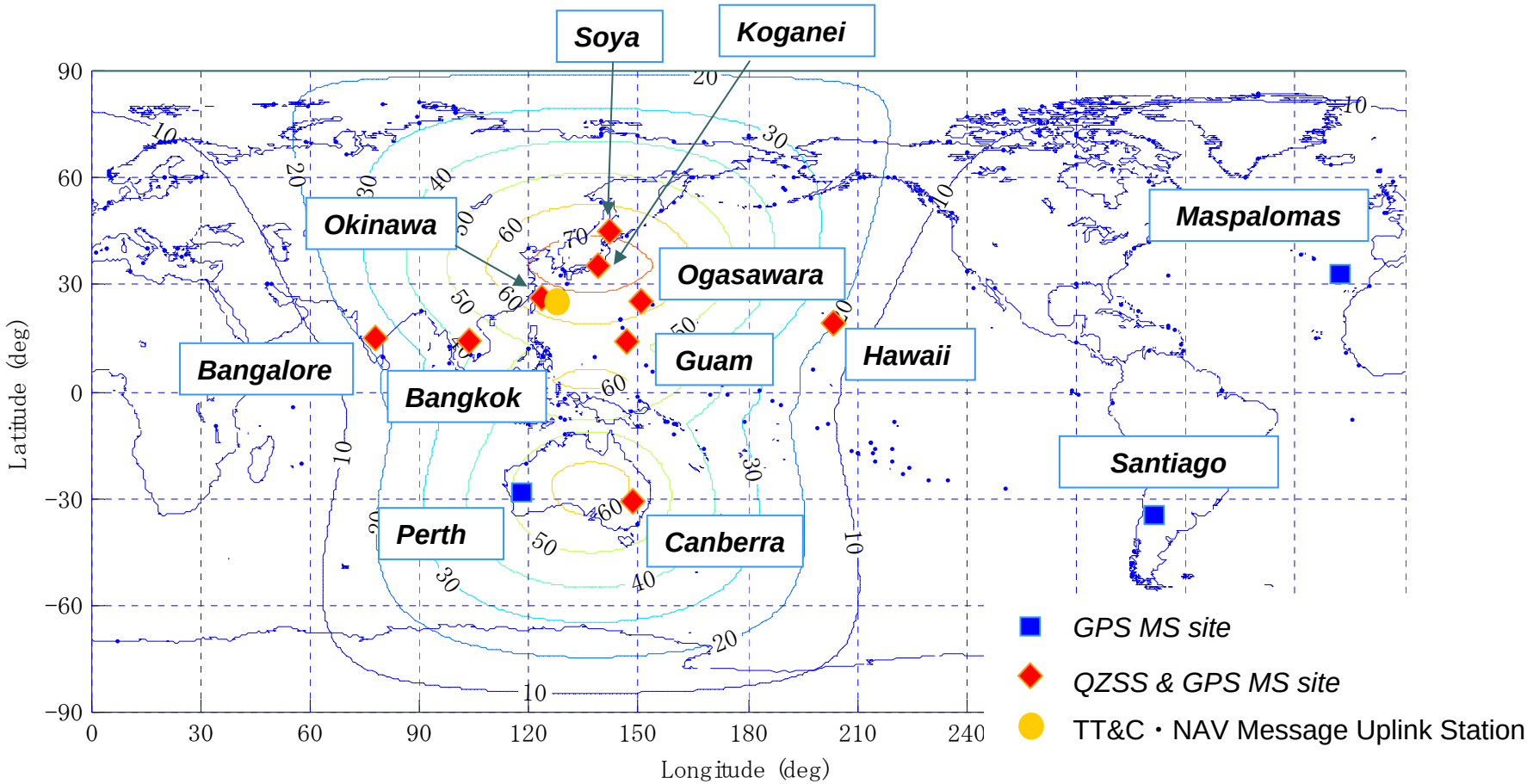
System Description (3)
Space Segment - QZS-1

Mass	**Approx. 1,800kg (dry)** **(NAV Payload：Approx. 320kg)**
Power	**Approx. 5.3 kW (EOL)** **(NAV Payload: Approx. 1.9kW)**
Design Life	**10 years**



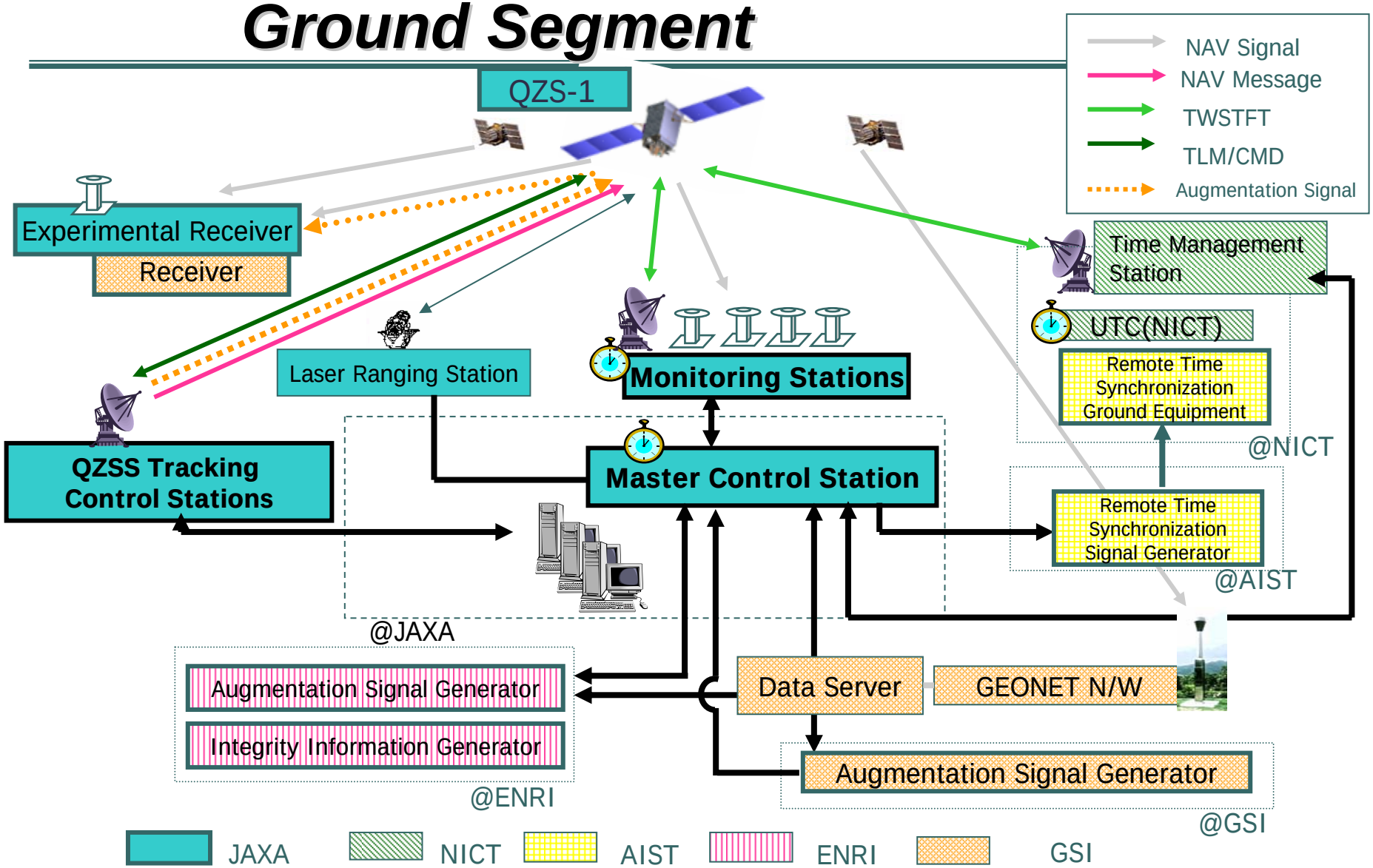
Satellite Configuration on Orbit

System Description (4)
Ground Segment



Okinawa is primary TT&C station for nominal operation.
The number and locations of secondary sites are still being investigated.

System Description (5)
Ground Segment



System Description (6)
Planned Signals

- Planned Signal List for QZSS

Generic Signal Name	*Center Frequency*	*Notes*
L1-C/A	1575.42MHz	■ GPS interoperable signals ■ Compatibility and interoperability with existing and future modernized GPS signals
L1C		
L2C	1227.6MHz	
L5	1176.45MHz	
L1-SAIF*	1575.42MHz	■ Compatibility with GPS-SBAS ■ WDGPS
LEX	1278.75MHz	■ Experimental Signal with higher data rate message (2Kbps) ■ Compatibility with Galileo E6 signal

****L1-SAIF: L1-Submeter-class Augmentation with Integrity Function**

Release of Draft IS-QZSS

- *IS-QZSS describes;*
  - *System architecture of whole QZSS*
  - *Signal structure and specifications*
  - *Service properties*
- *First draft of IS-QZSS (ver. 0.0) was released January 22, 2007.*
- *Second draft, IS-QZSS ver. 0.1 was released June 8, 2007 on following web site.*

  :http://qzss.jaxa.jp/is-qzss/index_e.html
- *Third draft of IS-QZSS (ver. 1.0) is being prepared and to be released in November, 2007.*

Perspective on Compatibility and Interoperability

- *GPS*
  - *GPS-QZSS Technical Working Group (TWG) established to achieve compatibility and technical interoperability between QZSS and current and future configurations of GPS in 2002.*
  - *QZSS and GPS success in designing "common" signals*
    - *Five of six QZSS signals use same signal structures, frequencies, spreading code families, data message formats as GPS or SBAS signals*
  - *US-Japan Joint Statement, 27 January 2006 :*
    - *The Technical Working Group concluded that GPS and QZSS are designed to be fully interoperable and compatible.*
- *Galileo*
  - *JAXA - EU had six coordination meetings to secure RF compatibility between QZSS and Galileo.*
  - *QZSS and Galileo have same spectrum of L5–E5a, LEX-E6CS, and almost close one in L1C-E1OS.*

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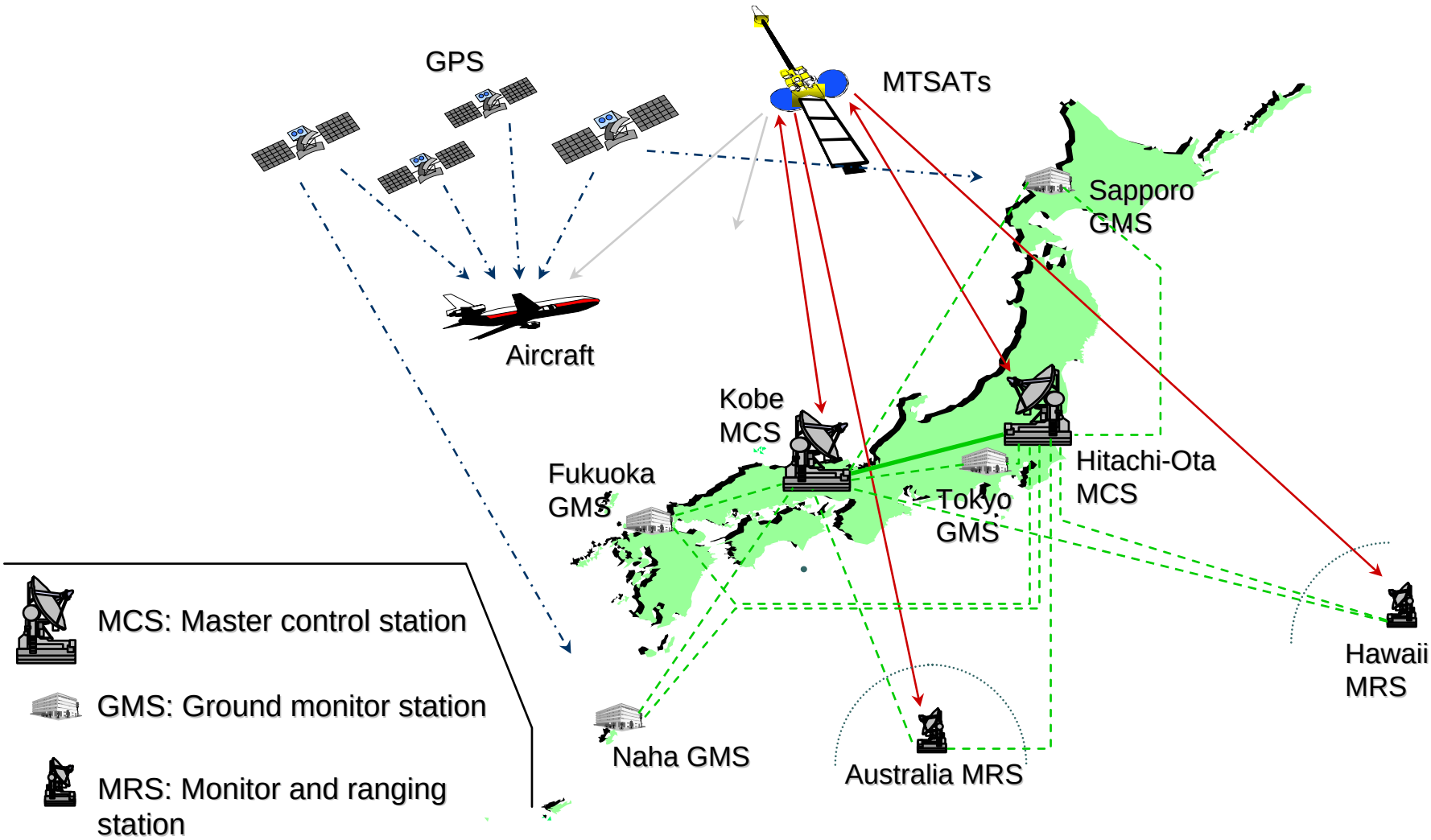
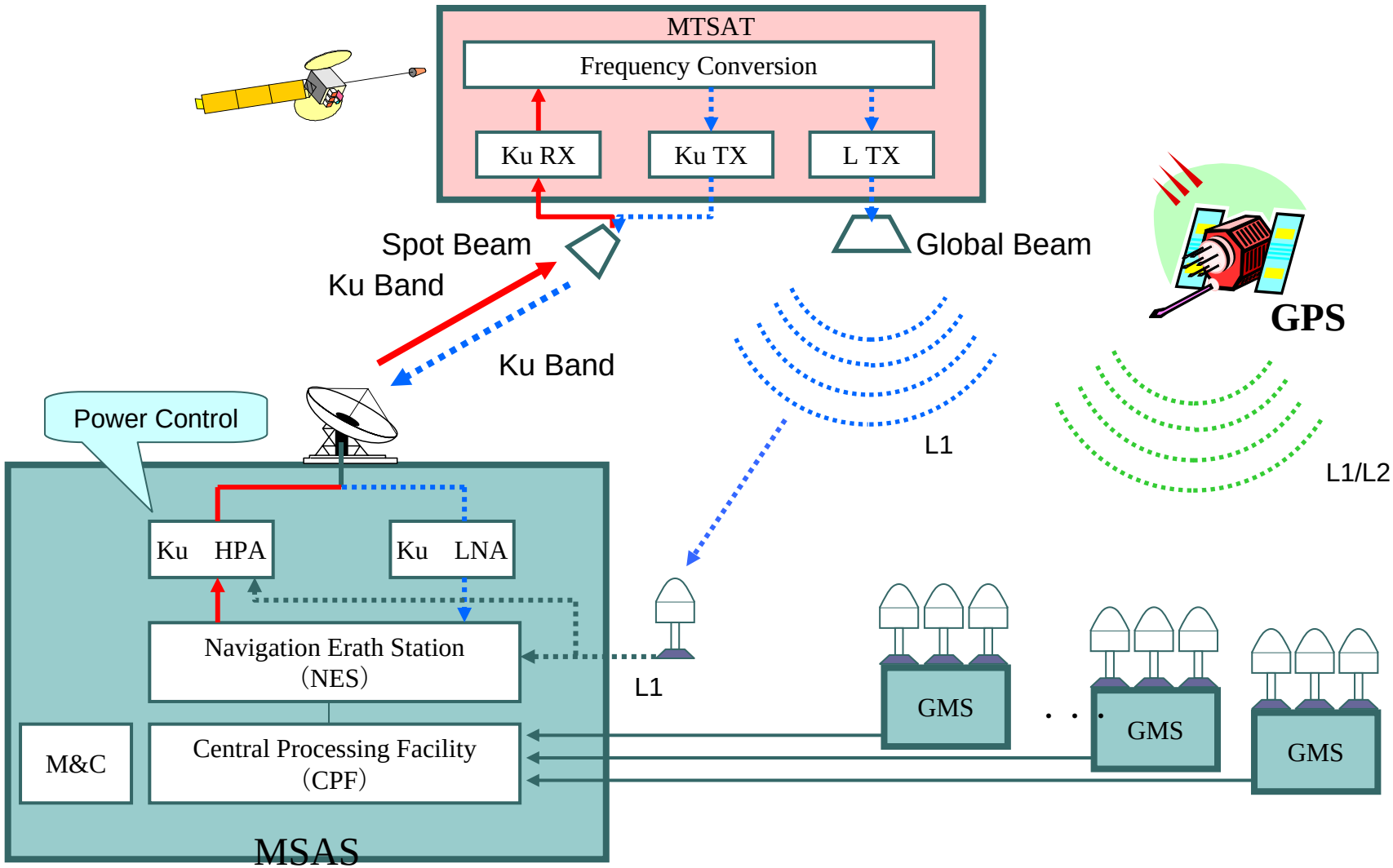
MSAS Configuration(1)



MSAS Configuration(2)

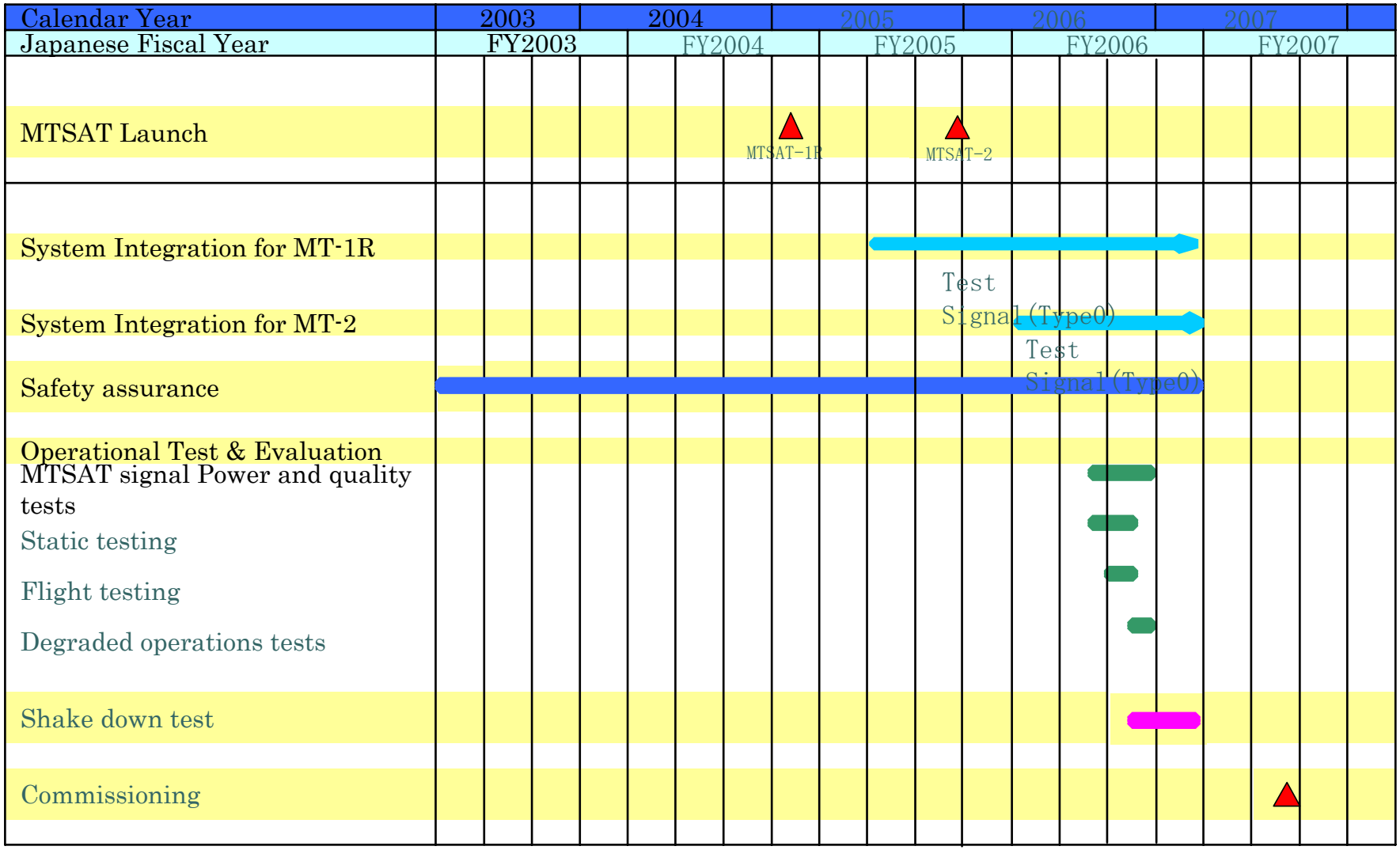


MTSAT History

- MTSAT-1R
  - Date
    - 26 February 2005
    - 18:25 (JST)
  - Launcher
    - H-IIA No.7

- MTSAT-2
  - Date
    - 18 February 2006
    - 15:27 (JST)
  - Launcher
    - H-IIA No.9

MSAS Implementation Schedule



MSAS Status (1)

- MTSAT-1R was launched in 2005
  - Located at 140E
- Meteorological Mission by MTSAT-1R has been operated since 28 June, 2005
- MTSAT-2 was launched in February 2006
  - Located at 145E
- MSAS Total System Integration with Two MTSATs was Completed
- Operational Test & Evaluation was Completed

MSAS Status (2)

- MSAS Test Signal Transmission
  - Type-0 message from MTSATs is now available prior to commissioning
  - PRN 129 by Kobe and PRN 137 by Hitachi-ota
  - Transmission Schedule is available on Kobe Aeronautical Satellite Center Web Site

    http://www.kasc.go.jp/MSAS/index_e.html
- MSAS Initial Operational Capability (IOC) from en-route to NPA with dual MTSAT coverage will be achieved and commissioned on 27 Sep. 2007.

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Summary

QZSS

- The QZSS development is going forward into next step.
  - NAV system: completed CDR and NAV payload PFM manufacturing started.
  - First Satellite system: completed PDR.
- A new law, "*Fundamental Act of Promotion for Utilization of Geographical Spatial Information"* enforced on the end of August, 2007.

MSAS

- System Integration, Operational Test & Evaluation was Completed successfully.
- IOC for en-route and NPA is to be commissioned on September 27, 2007.